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(54) Process for the control of the sensitivity of a photosensitive charge transfer device and device for performing this process

(57) The process consists of using anti-glare drains provided on the device for discharging the charges generated by the light during a first part of the analysis period of each field. A servocontrol device 55-59 determines the discharge duration, as a function of the values of the video signal obtained. In order to discharge charges to the anti-glare drains, which are maintained at a constant potential by the electrodes surmounting them, a pulsating voltage is simultaneously applied to the two transfer electrodes surmounting each photosensitive element of the device. A single pulse is not sufficient to discharge all the charges to the drain and for this reason a succession of pulses is provided making it possible to discharge the accumulated charge (decrementally). This succession of pulses is applied for the duration of a line blanking interval of the video signal, in order to ensure that stray couplings do not disturb the video signal.

FIG_5

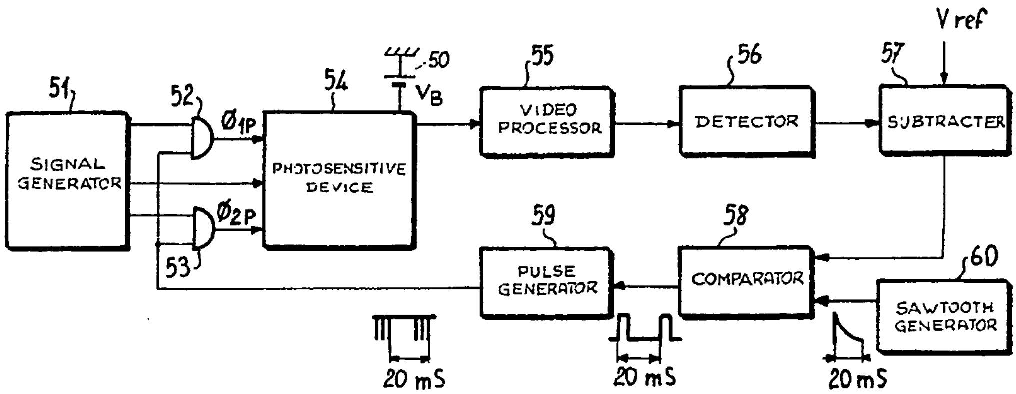

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FIG_1

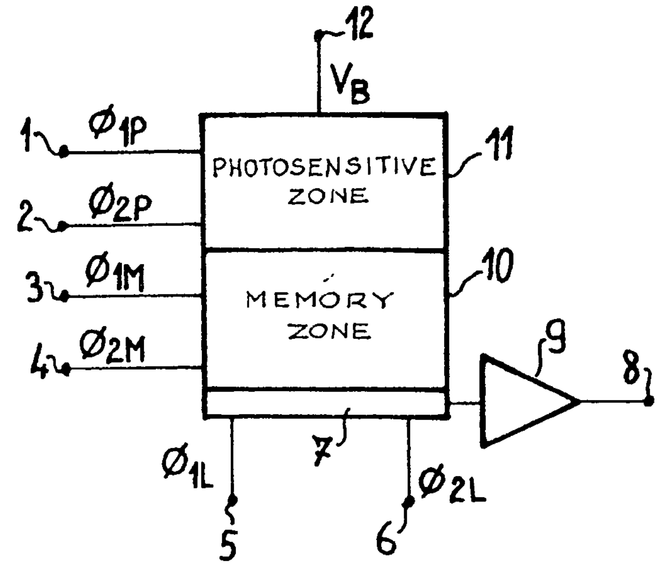


FIG_2

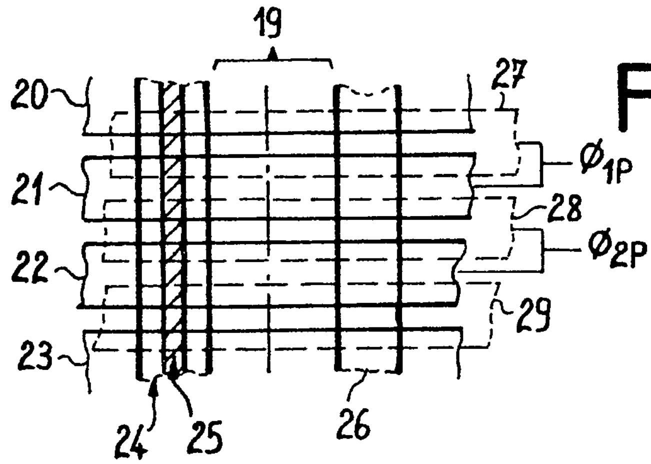


FIG_3

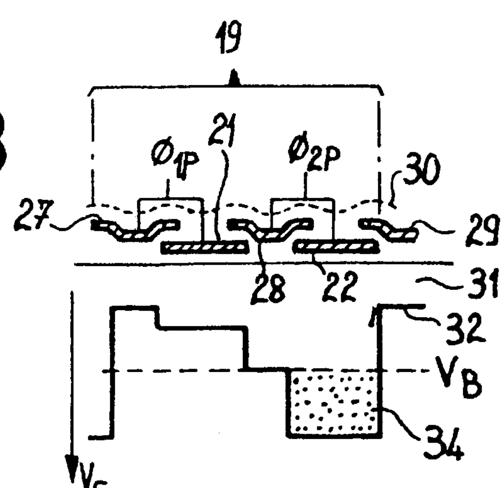


FIG_4-a

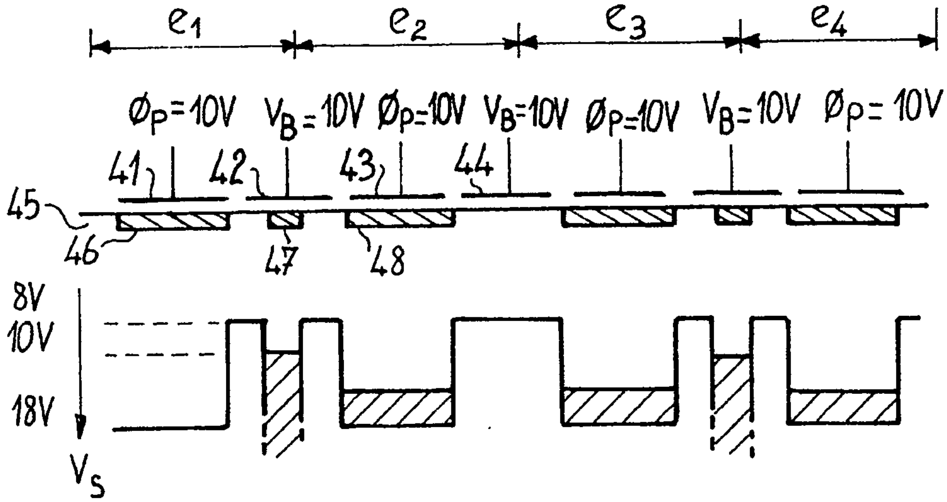


FIG_4-b

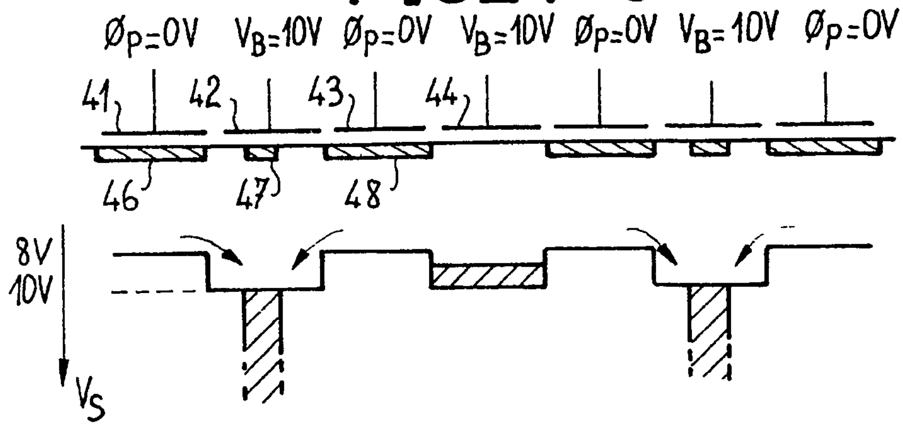


FIG_4-c

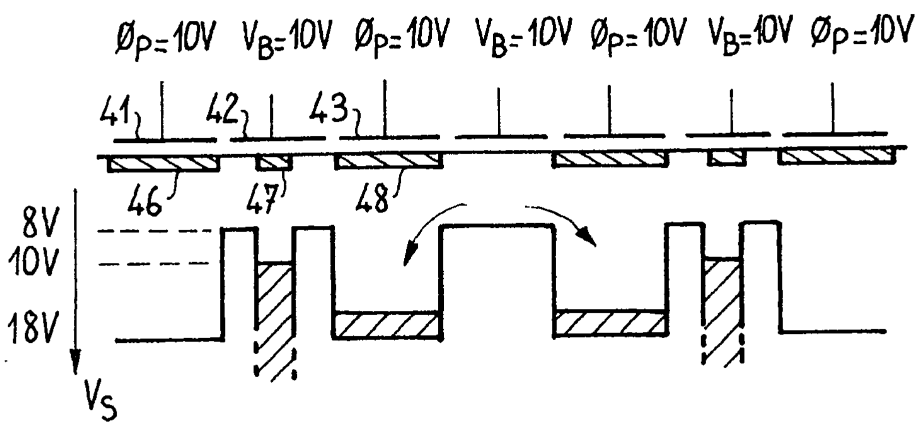


FIG_5

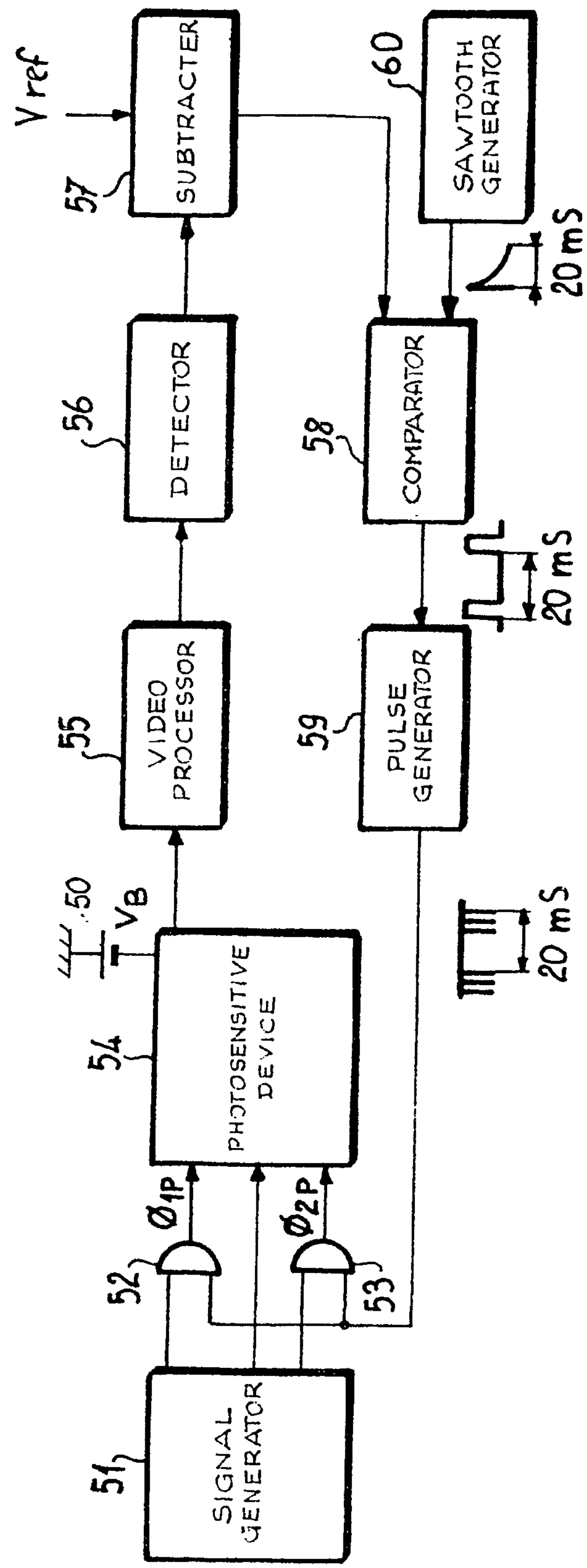

V ref
SUBTRACTER
57
60
SAWTOOTH GENERATOR
20 mS
DETECTOR
56
COMPARATOR
58
20 mS
VIDEO PROCESSOR
55
PULSE GENERATOR
59
50
V_B
20 mS
PHOTOSENSITIVE DEVICE
54
$Ø_{1P}$
$Ø_{2P}$
52
53
SIGNAL GENERATOR
51

FIG_6

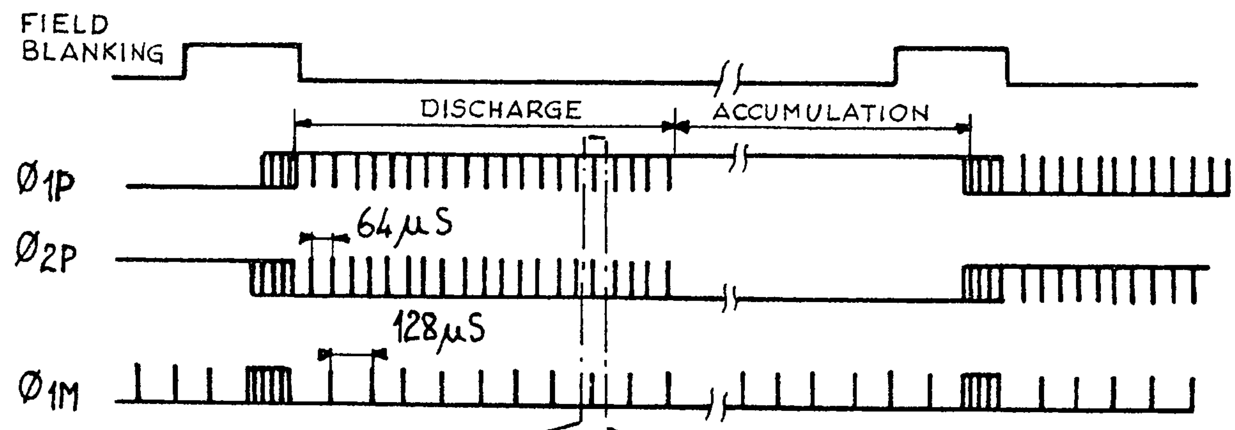
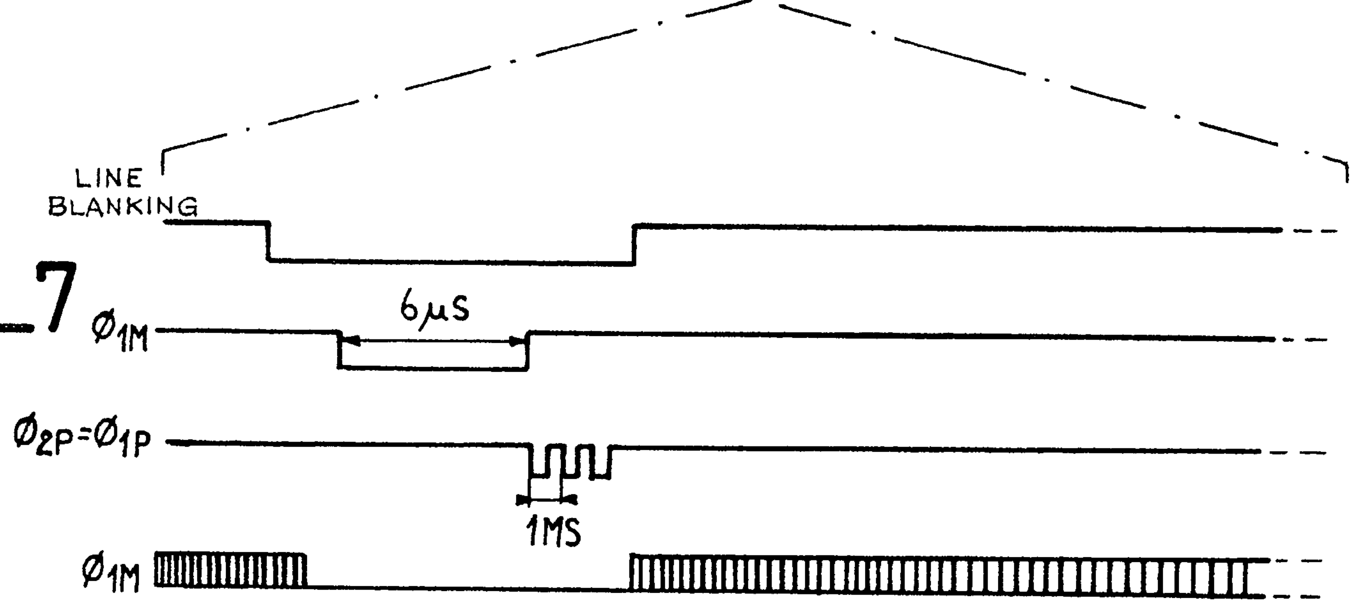


FIG_7



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SPECIFICATION

Process for the control of the sensitivity of a photosensitive charge transfer device and device for performing this process

The present invention relates to a process for the control of the sensitivity to light of a photosensitive charge transfer device used in a television camera. The invention also relates to a device for performing this process. When the illumination is very strong, charge transfer devices undergo a saturation and glare, so that it is necessary to equip them with another device reducing their sensitivity in this case.

The conventional process consisting of reducing the quantity of light by an iris operated by a motor cannot always be used due to the very severe operating constraints in certain applications, such as military applications. It is for this reason that purely electronic processes have been developed.

An interline or interfield photosensitive charge transfer device comprises a matrix of photosensitive elements onto which is projected the light of an image, in order to produce in each element an electric charge, which is proportional to the illumination received and to the accumulation duration of said charges. It also comprises a matrix of memory elements, to which are transferred the said charges for storage there, whilst waiting to be discharged to an output for generating a video signal. Among the known photosensitive devices, a distinction is made between several different types, particularly field transfer devices. In the case of a photosensitive field transfer device, these two matrixes are separate, the charges being accumulated for the duration of one frame, transfer taking place during the interval between the analysis of two fields, whilst the charges ar discharged or removed during the analysis period for the following field. The displacement of the charges, for their transfer and discharge, is controlled by electric fields applied by means of an electrodie network surmounting the photosensitive elements and the memory elements.

To prevent saturation and glare, it is possible to reduce the accumulation time of the charges in the photosensitive elements. As the exposure time of the photosensitive elements to light is fixed by the analysis time of one field, the reduction of the charge accumulation time is then carried out by neutralizing the electric charges generated by the illumination during part of the exposure time corresponding to one field. This neutralization can be carried out by several different processes, which are in particular dependent on the technical structure of the photosensitive device in question.

In the case of a so-called surface transfer device, the neutralization of the charges generated by the illumination can be carried out in a simple manner by polarizing all the elements surmounting the photo-sensitive elements by a voltage which is close to the polarizing or bias voltage of the substrate. The charges generated by the illumination then recombine as they are being formed, so that there is no accumulation. However, devices which are used for carrying out surface transfer suffer from numerous disadvantages the most important of which are low efficiency of the charge transfer, due to charges generated by the illumination during the transfer period, together with a low transfer speed, which limits the sensitivity regulation dynamics, because the accumulation period cannot be of the same order of magnitude as the transfer period, otherwise there would be a serious deterioration to the quality of the image. Moreover, the deterioration of the image is not uniform, because the charges generated in the photosensitive elements furthest from the zone of memory elements undergo a longer transfer than those generated in the closer elements, so that they are exposed for a longer period to the parasitic effect of the illumination during transfer.

The volume photosensitive transfer devices permit a shorter transfer time, which allows a shorter accumulation time, i.e. bring about a greater dynamics of the sensitivity control. However, such a photo-sensitive device differs from a surface transfer device by the values of the surface potential, for identical polarizations of the electrodes and it is only possible to neutralize the charges generated by the illumination according to the same process for a surface transfer device.

U.S. Patent 3,931,463 describes a process for the control of the sensitivity of a photosensitive field transfer device, where the charges are transferred in volume and which consists of reducing the charge accumulation time by discharging the charges generated by the illumination during part of the analysis period of one frame, said charges being discharged to a drain located along the matrix of photosensitive elements and on the side opposite to that where the matrix of memory elements is located. During a first part of the analysis period of one field, the electrode surmounting the photosensitive elements receive voltages which are phase-displaced with respect to one another, so as to transfer the charges to the drain and then during a second part of the analysis period of the field, said electrodes receive voltages phase-displaced in a different way in order to reverse the displacement direction of the charges, so as to transfer them to the memory elements. The drain has a constant polarization of values such that it makes it possible to discharge the minority carriers generated by the illumination. Moreover, the transfer of charges to the drain is not carried out in a continuous manner throughout the first part of the analysis period of a field. It is carried out for the duration of the line blanking intervals of the video signal supplied by the output of the photosensitive device to ensure that said video signal is not disturbed by interference pulses induced by the control signals of the electrodes, applied for carrying out said transfer to the drain.

For example, during a line blanking interval lasting 10 microseconds, the charges contained by about 10 to 15 lines of photosensitive elements are transferred into the drain. This transfer is repeated for several successive line blanking intervals in order to neutralize the charges generated over the entire matrix of photosensitive elements.

This process suffers from the disadvantage of requiring the realisation of a drain and the realisa-

tion of electrodes, whilst using three or four clock signals to permit the transfer in two opposite directions. Moreover, the discharge to the drain of the charges generated in the photosensitive elements furthest therefrom requires a relatively long transfer time during which the illumination continues to generate charges so that there is a lack of uniformity of the charge accumulation times, as a function of the position of the photosensitive elements in the matrix.

In order to be able to carry out the transfers in two opposite directions, it is necessary to use three or four electrodes per photosensitive element and these are respectively polarized by three or four phase-displaced clocks, whereas two electrodes polarized by two phase-displaced clocks are sufficient when it is wished to have a transfer in a single direction. In the latter case, the electrodes or the diffusions in the semiconductor are produced in an asymmetrical manner, which determines the charge transfer direction and this is simpler than having three or four electrodes per photosensitive element.

The process according to the invention obviates these disadvantages by providing anti-glare drains, such as are provided on most recent photosensitive charge transfer devices. The device according to the invention is used for realising this process.

The present invention specifically relates to a process for the control of the sensitivity of a photosensitive charge transfer device, the latter comprising a plurality of photosensitive elements, where electric charges are generated by the light of an image during first time interval; a plurality of memory elements, where these charges are stored during second time intervals, before being discharged to an output for generating a video signal; a plurality of electrodes surmounting the photosensitive elements for controlling displacements of the charges; a plurality of anti-glare drains inserted between the photosensitive elements, in such a way that each photosensitive element is adjacent to a drain; the process consisting of discharging by the anti-glare drains the charges generated by the light at the start of each of the first intervals, displacing said charges to the drains during a certain number of third time intervals corresponding to line blanking intervals of the video signal supplied by the output of the photosensitive device, said number being a function of the brightness of the complete image.

The invention is described in greater detail hereinafter relative to non-limitative embodiments and the attached drawings.

Figures 1 to *3* diagrammatically show a photosensitive two-phase field transfer device having anti-glare drains.

Figures 4a to *4c* illustrates the operation of this device when the process according to the invention is realised.

Figure 5 shows the synoptic diagram of an embodiment of the device according to the invention.

Figures 6 and *7* show chronograms illustrating the operation of said embodiment.

Figure 1 shows a synoptic diagram of a photosensitive device of type THX 1138 marketed by the French Company THOMSON-CSF and which makes it possible to analyze an image frame in 288 lines, each having 208 elementary dots or points. It operates according to the field transfer principle, transfers being carried out by means of two phase-displaced clocks and it has linear anti-glare drains inserted between columns of photosensitive elements, at a rate of one drain per two photosensitive element columns.

In Figure 1, the device has a photosensitive zone 11 constituted by a matrix of 288 lines, each having 208 photosensitive elements, as well as a memory zone 10 constituted by a matrix having the same number of memory elements, together with an output register 7 and an output amplifier 9. One side of photosensitive zone 11 is connected to one side of memory zone 10 and across said side is effected the charge transfer during the time interval corresponding to the interfield interval of the video signal supplied by the photosensitive device.

Photosensitive zone 11 has three input terminals 1, 2 and 12 respective receiving a clock signal ϕ_{1P}, a clock signal ϕ_{2P} and a d.c. voltage for the polarization of the anti-glare drains and of value V_B with respect to the substrate.

The memory zone 10 has two input terminals 3, 4, which respectively receive the phase-displaced clock signals ϕ_{1M} and ϕ_{2M}. The memory zone 10 has a second side, which is connected to output register 7, into which the charges are transferred in groupwise manner corresponding to one line. The output register 7 has two input terminals 5, 6, which respectively receive phase-displaced clock signals ϕ_{1L} and ϕ_{2L} and an output connected to the input of an output amplifier 9, which is connected to an output terminal 8 supplying a video signal.

An image is projected by an optical system onto photosensitive zone 11. The photons of the illumination brought about by said image produce electron-hole pairs in the photosensitive elements of zone 11. Charges accumulate in these elements proportionally to the illumination received and its duration. In this example, the integration time is equal to the analysis time of one field, i.e. 20ms, less the time necessary for the transfer of the charges to the memory zone of approximately 1ms. When the photosensitive device is used in the conventional manner during the accumulation period the clock signals ϕ_{1P} and ϕ_{2P} have a constant value, so that the polarization of the photosensitive elements permits the accumulation of charges in said elements. In order to analyze the interlaced even field and uneven fields, said constant values are interchanged from one frame to the next in order to bring about a displacement corresponding to a half-element in the vertical direction of the photosensitive elements where the charges are accumulated.

During the interfield interval, the clock signals ϕ_{1P}, ϕ_{2P}, ϕ_{1M} and ϕ_{2M} receive phase-displaced pulses, whose number corresponds to the number of lines of matrixes of the photosensitive zone 11 and of the memory zone 10 for transferring charges from zone 11 to zone 10. During the analysis of the following field, i.e. the accumulation of new charges in photosensitive zone 11, the charges of the memory zone

10 are transmitted into register 7 in groups each corresponding to one line, by applying reciprocally phase-displaced clock pulses ϕ_{1M} and ϕ_{2M} and whose number corresponds to the number of lines of the matrix of the memory zone 10. The content of output register 7 is transferred to amplifier 9 under the action of clock signals ϕ_{1L} and ϕ_{2L}, which are phase-displaced with respect to one another and whose frequency corresponds to the analysis timing of the image elements.

Figure 2 diagrammatically shows a photosensitive element 19 of zone 11. It comprises four horizontal electrodes 20, 21, 22 and 23 located on a first layer on the surface, three electrodes 27, 28, 29 located in a second layer below the first, two vertical electrodes 24, 26 located in a third layer and a type N, vertical anti-glare drain 25 located in the P-type substrate.

Electrodes 24, 26, 27, 29 approximately define the photosensitive element 19, which is shown in hatched manner in the drawings. Naturally, this photosensitive element is displaced, if the polarizations produced by the constant values of the clock signals ϕ_{1P} and ϕ_{2P} are interchanged. The difference layers are insulated from one another by silicon oxide and they are sufficiently thin to be transparent to light. The clock signal ϕ_{1P} is applied to electrodes 27 and 21. Clock signal ϕ_{2P} is applied to electrodes 28 and 22. In addition, clock signal ϕ_{2P} is applied to electrode 20 and clock signal ϕ_{1P} is applied to electrode 23, by connections which are not shown in the drawing.

Figure 3 is a section along AA' of the photosensitive element 19 shown in Figure 2. A substrate 31 is surmounted by a silicon oxide layer 30 in which are buried electrodes 27, 21, 28, 22 and 29. Electrodes 27 and 21 receive the clock signal ϕ_{1P} and are dissimilar, in order to bring about different potentials on the substrate surface. In the same way, electrodes 28 and 22 receive clock signal ϕ_{2P} and are dissimilar, in order to bring about different potentials on the surface of substrate 31. The asymmetry of the electrodes makes it possible to effect a charge transfer in a given direction, from left to right, whilst only using two phase-displaced clock signals. Figure 3 also shows the graph of the potential V_S at the surface of substrate 31 along said section AA'. This potential decreases in stages beneath electrodes 22, 29, 21 and 27, which leads to the displacement and accumulation of charges in a potential well 34 located beneath electrode 22.

The potential V_B of the anti-glare drain is intermediate between the potential beneath electrode 27 and the potential beneath electrode 22, it corresponds approximately to the potential prevailing beneath electrode 28. An illumination excess leads to an accumulation of charges in the potential well 34, so that the charges exceed potential V_B and are absorbed by the anti-glare drain 26. Figure 3 does not show the vertical electrodes 24, 26 and the anti-glare drain 25, which are positioned parallel to the represented sectional plane.

Figures 4a, 4b and 4c diagrammatically represent the operation of four photosensitive elements e_1, e_2, e_3 and e_4, when the process according to the invention is applied. These Figures show a section perpendicular to section AA' of Figure 3, but with the convention that the electrodes are all shown as belonging to the same layer. There are transfer electrodes 41, 43 receiving a clock signal ϕ_P, which can be ϕ_{1P} or ϕ_{2P}, as a function of the location where the section is made, together with static polarization electrodes 42, 44 receiving the bias voltage V_B of the anti-glare drains.

A first photosensitive element e_1 has an electrode 41 surmounting a type N diffusion 46 in the type P substrate 45 and has an electrode 42 receiving voltage V_B and surmounting a type N diffusion 47 forming the anti-glare drain. Electrode 42 belongs half to element e_1 and half to element e_2.

Element e_2 also has an electrode 43 receiving the clock signal ϕ_P and surmounting a type N diffusion 48 and has an electrode 44 receiving the voltage V_B, but which does not surmount an anti-glare drain, because the latter is only provide for every other column in the present example of a photosensitive device. Electrode 44 belongs half to element e_2 and half to element e_3. Element e_3 also has electrodes and diffusions identical to electrodes 41, 42 and diffusions 46, 47 of element e_1. In the same way, element e_4 is identical to element e_2. The lower part of Figures 4a, 4b and 4c shows the graph of the potential V_S at the substrate surface, in the different stages of the operation when the process according to the invention is put into effect.

In this example, the process according to the invention consists of discharging the charges generated by the light during a first part of the accumulation period, in order to reduce the effective duration of said accumulation, the charges being discharged to anti-glare drains 47. The voltage V_B applied to the electrodes 42, 44 is equal to 10V permanently. Electrode 44 produces a potential barrier of value 8V separating the photo-sensitive elements e_1 and e_2. Electrode 42 surmounts the anti-glare drain 47 and is wider than the latter. The latter produces a potential well of value 10V, which is bordered on either side by a potential barrier of value 8V produced by electrode 42.

The charges are discharged by applying a same pulsating voltage to the electrodes which normally receive the clock signals ϕ_{1P} and ϕ_{2P} of constant value during the accumulation. This pulsating voltage is e.g. constituted by a burst of 3 pulses lasting one microsecond and repeated for a certain number of time intervals corresponding to the line blanking intervals of the video signal supplied by the output of the photosensitive device. Figures 4a and 4c illustrate the action of two first pulses of the burst and are described hereinafter.

When pulses signals are applied to the charge transfer electrodes 41, 43, etc, stray couplings within the photosensitive device transmits these signals and superimpose them on the video signal, thus producing defects which are visible in the restored image if said pulsed signals are applied during the useful period of the video signal. It is for this reason that the charges are only discharged during the line blanking intervals of said video signal. The number of line blanking intervals during which discharge takes place is a function of the illumination received

by the photosensitive device. A subsequently described servocontrol device determines this number of intervals.

In Figure 4a, the transfer electrodes 41, 43, etc receive a voltage of 10V, i.e. of the same value as the voltage applied to electrodes 42 and 44. Thus, there are potential wells of 18V accumulating charges beneath the transfer electrodes 41 and 43. On either side of drain 47, the surface potential takes on a value of 8V, which forms a barrier preventing the charges from passing into the potential well of value 10V of drain 47.

Figure 4b shows the operation when, for discharging the charges, the voltage of clock signals ϕ_{1P} and ϕ_{2P} have a value OV.

Beneath the transfer electrodes 41, 43, etc, there are no longer any potential wells for accumulating the charges and the potential has the value 8V. Beneath electrode 42 and electrode 44, there is a potential well of value 10V. Beneath drain 47, the potential well of value 10V attracts and discharges the charges, whereas beneath electrode 44 the absence of a drain does not permit this discharge. Thus, beneath electrode 44 there remains a certain quantity of charges which is not discharged. Thus, the process must be repeated for discharging the charges remaining beneath electrode 44.

Figure 4 shows the operation when the voltage applied to the transfer electrodes 41, 43 again has the value 10V. There is once again a potential well of value 18V accumulating charges beneath the transfer electrodes 41, 43. Beneath electrode 44, the surface potential returns to the value 8V, so that the preceding potential well disappears. The charges which were contained in it drop into potential wells located the two adjacent transfer electrodes, particularly electrode 43. Beneath the electrodes such as electrode 42, which surmounts the anti-glare drain 47, a potential well of 10V is insulated by two potential barriers of value 8V. During the next pulse which will give the transfer electrodes 41 and 43 a voltage of OV, the charges in the potential wells, such as that located beneath electrode 43, will subdivide again, one part being discharged by the anti-glare drain 47 and one part remaining accumulated beneath electrode 44. The part remaining beneath electrode 44 decreases on each iteration and can be considered as zero when three OV pulses have been applied to the transfer electrodes 41 and 43. Thus, charge discharge takes place progressively in several stages, their number depending on the illumination received.

Figure 5 is a synoptic diagram of an embodiment of the device according to the invention making it possible to render the sensitivity of a photosensitive device 54, like that described hereinbefore, dependent on the illumination received by it.

This device comprises a signal generator 51, a generator 50 of fixed voltage V_B, two logic AND gates 52, 53, a video processor 55, a detector 56, an analog subtracter 57, a comparator 58, a pulse generator 59, as well as a parabolic sawtooth generator 60. Generator 50 supplies a voltage V_B = 10V to an input of device 54 for polarizing the anti-glare drains to a fixed potential permitting their operation in the case of glare. The signal generator 51 supplies the photosensitive device 54 with all the conventional control signals, particularly two phase-displaced clock signals applied to the transfer electrodes surmounting the photosensitive zone. These signals are transmitted to device 54, respectively by gates 52 and 53. The latter permit the superimposition thereon of pulse bursts permitting the discharge of charges in order to reduce the integration time. Thus, their outputs supply clock signals ϕ_{1P} and ϕ_{2P} to device 54.

An output of device 54 is connected to an input of video processor 55 in order to supply a video signal thereto. This processor 55 brings this video signal into the standard form. An input of detector 56 is connected to the output of processor 55 to receive the shaped video signal. This detector has an output supplying a voltage representing the brightness of the complete image and which is intermediate between the mean voltage and the peak voltage of the video signal, so as not to make the sensitivity dependent solely on the brightest details of the image. This voltage is applied to an input of subtracter 57 which receives at another input, a d.c. voltage V_{ref} in order to subtract it from the voltage supplied by detector 56. The output of subtracter 57 supplies an error voltage, which is applied to one input of comparator 58. A second input of comparator 58 receives a signal of period 20mS in the form of parabolic sawteeth supplied by generator 60. This sawtooth has a decreasing amplitude as a function of time with a slope which decreases as a function of time.

The comparator 58 and generator 60 form a voltage - non-linear duration converter, which supplies a pulse signal of period 20mS, having a duration equal to that during which the error signal exceeds the voltage supplied by generator 60. This duration corresponds to a certain number of lines at the start of each frame. This signal validates the pulse generator 59, to generate a sequence of bursts of three pulses lasting 1 microsecond, with a burst period of 64 microseconds corresponding to the period of the lines. These pulses have a value 0 and lock the gates 52, 53. The outputs of generator 51 supply a constant signal of value 1, so that the outputs of gates 52, 53 supply pulse bursts of value O. This logic value 0 is represented by a voltage of 0 value with respect to the substrate of device 54.

If the sawtooth was linear, the duration of the pulse signal validating generator 59 would be proportional to the error voltage, no matter what the value of said duration. However, it is desirable for the time variations to be proportional to the variations of the error voltage and to the charge integration time, so as to increase the variation of the time period when the integration time is long. High integration time values correspond to low charge discharge time periods, i.e. at the start of each sawtooth and it is for this reason that the sawtooth has a greater slope at the start than at the finish of each period.

Figure 6 shows chronograms of the clock signals ϕ_{1P}, ϕ_{2P} and ϕ_{1M} during a field period. During the end of each field blanking pulse, these three clock signals

comprise pulses controlling the transfer of charges accumulated in the photosensitive zone 10 to the memory zone 11. In the time interval between two transfers, a first part is used for the discharge of charges to prevent the accumulation thereof and the second part is used for the accumulation of the charges. The respective duration of these two parts is controlled as a function of the illumination received.

During the first part, the clock signals ϕ_{1P} and ϕ_{2P} incorporate bursts of three 1 microsecond pulses every 64 microseconds for the line blanking intervals. During the second part, the clock signals ϕ_{1P} and ϕ_{2P} are constant. The polarization produced by them retain the charges in the photosensitive elements, so that they accumulate there. It should be noted that during the following frame period, the values of these clock signals are interchanged in order to bring about a vertical displacement of the analysis, corresponding to a half-element for bringing about the interlacing of two frames.

In this example, each analysis frame is constituted by 144 lines, whereas the video signal corresponds to 288 lines of 64 microseconds and it is for this reason that the clock signal ϕ_{1M}, as well as the not shown clock signal ϕ_{2M}, have pulses every 128 microseconds corresponding to the transfer of charges from one line of memory zone 11 to output register 7 during the line blanking period in the video signal.

Figure 7 shows chronograms of clock signals ϕ_{1M}, $\phi_{2P} = \phi_{1P}$, and ϕ_{1L} in the vicinity of a line blanking pulse during which the charges are discharged. The clock signals ϕ_{2M} and ϕ_{2L} are not shown and are simply respectively complementary to clock signals ϕ_{1P} and ϕ_{2P}. During the line synchronization pulse, a clock signal ϕ_{1L} of duration 6 microseconds is generated in order to transfer the charges corresponding to a line to output register 7. Clock signals ϕ_{1P} and ϕ_{2P} have three pulses with a period of 1 microsecond for discharging into the anti-glare drain 25 the charges accumulated during the preceding line duration, i.e. for 64 microseconds. Clock signal ϕ_{1L} permitting the transfer of charges with the analysis timing of each image element to the output amplifier 8 has 218 pulses during each line period and has a constant level during the line blanking intervals.

The invention is not limited to the embodiments described hereinbefore and it falls within the routine activity of the Expert to adapt the process and device to other photosensitive devices having anti-glare drains in the vicinity of photosensitive elements, said drains making it possible to discharge charges when a pulsating voltage is applied to the transfer electrodes. This is possible no matter what the number of clock signals used for effecting the charge transfer. The number of pulses applied to the electrodes for discharging the charges to these drains can easily be adapted as a function of the characteristics of the electrodes, the capacity thereof limiting the transfer frequency.

CLAIMS

1. A process for the control of the sensitivity of a photosensitive charge transfer device, the latter comprising a plurality of photosensitive elements, where electric charges are generated by the light of an image during first time intervals; a plurality of memory elements, where these charges are stored during second time intervals, before being discharged to an output for generating a video signal; a plurality of electrodes surmounting the photosensitive elements for controlling displacements of the charges; a plurality of anti-glare drains inserted between the photosensitive elements, in such a way that each photosensitive element is adjacent to a drain; the process consisting of discharging by the anti-glare drains the charges generated by the light at the start of each of the first intervals, displacing said charges to the drains during a certain number of third time intervals corresponding to line blanking intervals of the video signal supplied by the output of the photosensitive device, said number being a function of the brightness of the complete image.

2. A process according to claim 1, applied to a photosensitive field transfer device, said photosensitive device having two separate zones, respectively constituted by a matrix of photosensitive elements and by a matrix of memory elements; having linear anti-glare drains, each separating two columns of photosensitive elements; and having an electrode surmounting each drain and a plurality of electrodes surmounting each photosensitive element; wherein discharging by means of the anti-glare drains the charges generated by the light at the start of each of said first intervals, consists of: applying a fixed potential to the electrodes surmounting the anti-glare drains, of value such that they discharge the excess charges in the case of glare; and applying constant potentials to the electrodes surmounting the photosensitive elements, said potentials having values such that the charges can accumulate beneath these electrodes during the first time intervals, each of the latter corresponding to the analysis period of one field, except during a certain number of third time intervals corresponding to line blanking intervals of the video signal, during which pulsed potentials are applied identically to all the electrodes surmounting the photosensitive elements.

3. A device for controlling the sensitivity of a photosensitive charge transfer device, said photosensitive device comprising a plurality of photosensitive elements where electric charges are generated by the light of an image during first time intervals; a plurality of memory elements, where said charges are stored during second time intervals before being discharged to an output for generating a video signal; a plurality of electrodes surmounting the photosensitive elements for controlling displacements of the charges; and a plurality of anti-glare drains inserted between photosensitive elements, in such a way that each photosensitive element is adjacent to a drain; comprising means for supplying a signal representing the brightness of a complete image projected onto the photosensitive device from the video signal generated by the latter; means for

supplying constant voltages to the electrodes surmounting the photosensitive elements of the photosensitive device during first time intervals, except during a certain number of third time intervals corresponding to line blanking intervals of the video signal supplied by the photosensitive device, said number being controlled by the duration of a control signal, and for supplying a pulsating voltage to all the electrodes surmounting the photosensitive elements during said third intervals; and means for generating the control signal with a duration which is a function of the value of the representative signal and which is less than the analysis time for one field.

4. A control device according to claim 3, in which the photosensitive device comprises two separate zones constituted respectively by a matrix of photosensitive elements and by a matrix of memory elements, where the anti-glare drains are linear, each separating two columns of photosensitive elements and being surmounted by an electrode; and where each photosensitive element is surmounted by a plurality of electrodes; whereby it also comprises a fixed voltage generator coupled to anti-glare electrodes; and means for supplying constant voltages to the electrodes surmounting the photosensitive elements during the first time intervals, each corresponding to the analysis time of one field, except during a certain number of third time intervals corresponding to line blanking intervals of the video signal, and for supplying a pulsating voltage to all the electrodes surmounting the photosensitive elements during said third time intervals.

5. A process for the control of the sensitivity of a photosensitive charge transfer device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

6. A device for controlling the sensitivity of a photosensitive charge transfer device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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